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PATENT ABSTRACTS OF JAPAN

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G02F 1/1333

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(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD

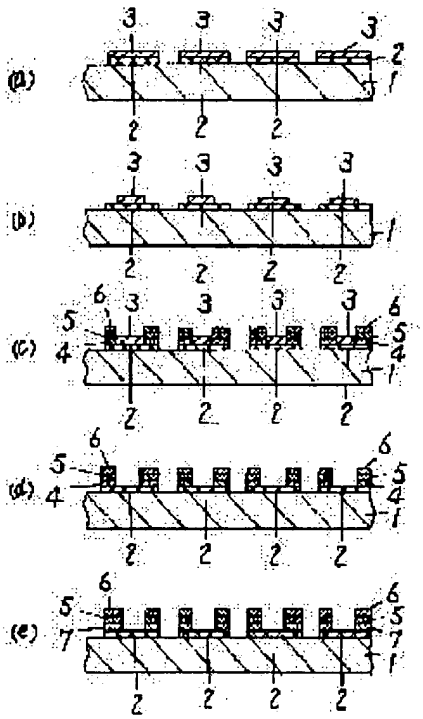
(72)Inventor : YAMAZOE HIROSHI
MITAMURA SADAO

(54) PRODUCTION OF SUBSTRATE FOR DISPLAY DEVICE

(57)Abstract:

PURPOSE: To provide the method for improving a display grade.

CONSTITUTION: ITO 2 is finely worked by hydriodic acid and a substrate is heated to shrink a photoresist 3; further, the exposed parts of the ITO 2 from the resist 3 are washed by the ozone generated when the resist is irradiated with UV rays. An indium electroplating 4 is then formed on the ITO by a soln. prepd. by dissolving indium sulfate and sodium sulfate in pure water. The substrate is then washed thoroughly and the electroplating of copper 5 is executed thereon by a soln. of an acidic copper sulfate system. A gold layer 6 is further formed thereon by an electroless plating liquid of gold. The resist 3 is peeled by an org. solvent and the substrate is washed and dried. The substrate is thereafter heat-treated.

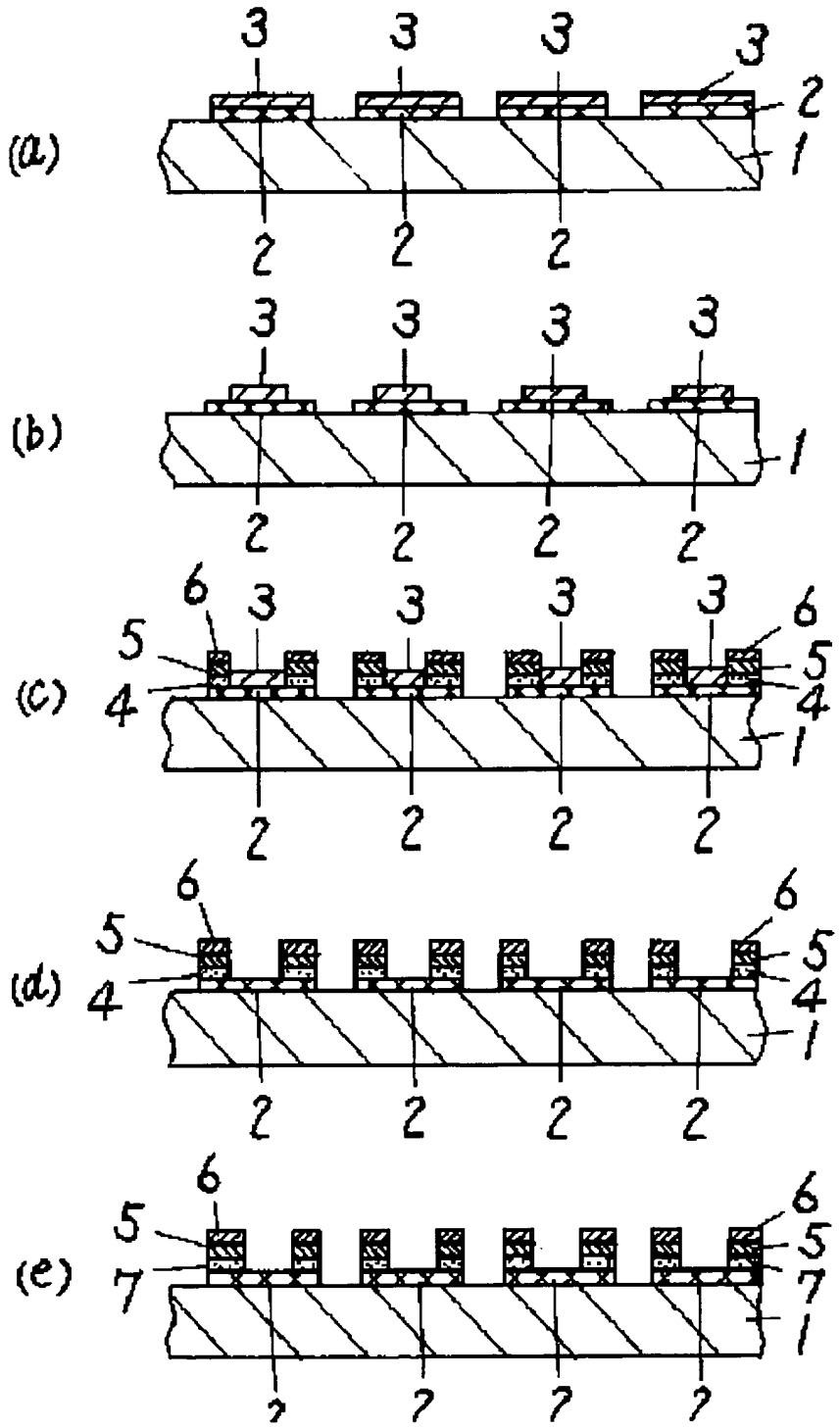


LEGAL STATUS

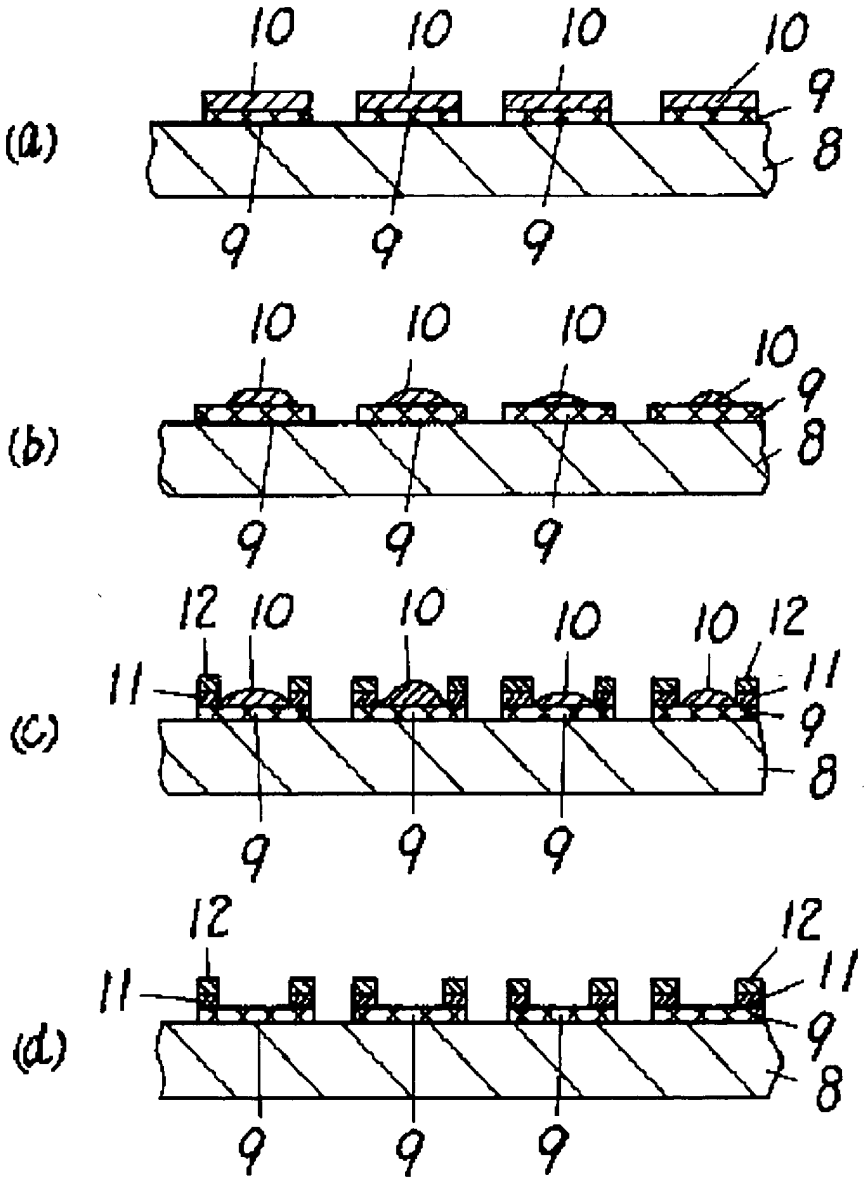
[Date of request for examination]

[Date of sending the examiner's decision of

1 ガラス基板
2 ITO
3 フォトレジスト
4 インジウム金属
5 銅
6 金



8 基板
9 ITO
10 フォトレジスト
11 ニッケル
12 金



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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The composition cross section for explaining the example of this invention
[Drawing 2] The composition cross section for explaining the example of this invention
[Description of Notations]
1 Glass Substrate
2 ITO
3 Photoresist
4 Indium Metal Layer
5 Copper Layer
6 Gold Layer of Front Face of Copper Layer
7 Layer Which Consists of an Alloy of Indium-Copper
8 Glass Substrate
9 ITO
10 Photoresist
11 Nickel Metal Layer
12 Gold Layer

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the process of the substrate for display, such as a liquid crystal display. It is related with lowering especially resistance of an electrode much more.
[0002]
[Description of the Prior Art] Display, such as a liquid crystal display, is technology which is surely needed as a man machine interface. Especially, in a computer terminal etc., it has become indispensable [a liquid crystal display] also from the meaning of downsizing recently.
[0003] Industrially, the oxide (the so-called ITO) of indium-tin is overwhelmingly used from points, such as an electric resistance value, a controllability at the time of production, membranous homogeneity, permeability of light, and micro-processing nature.
[0004] This technical content is a "thin film handbook" and the 131st committee of Japan Society for the Promotion of Science. It is detailed to editing and the Ohm-Sha Ltd. **.
[0005]
[Problem(s) to be Solved by the Invention] Recently, in the liquid crystal display used for a computer terminal etc., the demand of a high-definition display is actual. In these liquid crystal displays, the liquid crystal display in the simple modes, such as STN, is mainly used. In the display, the cross talk phenomenon etc. is reluctantly used for them in the present condition, although the deterioration of a display is looked at by these liquid crystal displays.
[0006] This phenomenon originates in the electric resistance value of a transparent electrode (ITO) not being low enough, therefore CR time constant being large. With the present technology, the rate of specific resistance of ITO is attained only to about 2x10-4ohmcm. Incidentally, the rate of specific resistance of gold, copper, and aluminum is about 2x10-6ohmcm.
[0007] However, although development of the substrate (the so-called auxiliary electrode) wired in contact with ITO in gold, copper, and aluminum is made, lack of the bond strength to ITO or a substrate poses a problem in this case.
[0008] Moreover, it is required that the cost of this auxiliary-electrode formation should be reduced as much as possible. For example, although the photo lithography method and the method using the vacuum evaporationo process are trustworthy, cost is high and is not considered to be the method very generally used.
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[0010]
[Means for Solving the Problem] In order that this invention may solve the above technical problems, on the transparent electrode covering the whole principal plane surface of a substrate Form the resist film patternized by the desired state and micro processing is carried out by the etching fluid of a transparent electrode. Wash, next shrink the aforementioned resist film and the outcrop of a transparent electrode is defecated with ozone or oxygen plasma. Indium electric-field plating is given to the outcrop of a transparent electrode. on this further Copper monolayer electric-field plating This order is made to give

and wash and dry the electric field of golden monolayer electric-field plating or copper electric-field plating, and gold, or two-layer plating of non-electric-field plating, and a resist film is removed, washed and dried. or by desired temperature profiles after this The process of a substrate for display which is heat-treated to a desired maximum temperature is offered.
[0011] this invention forms further the resist film patternized by the desired state on the transparent electrode covering the whole principal plane surface of a substrate. Wash by carrying out micro processing by the etching fluid of a transparent electrode, and next shrink the aforementioned resist film. The outcrop of a transparent electrode is defecated with ozone or oxygen plasma, and nickel electric field or non-electric-field plating is given to the outcrop of a transparent electrode. on this further Copper monolayer electric-field plating Or this order is made to give and wash and dry the electric field of golden monolayer electric field, non-electric-field plating or copper electric-field plating, and gold, or two-layer plating of non-electric-field plating, a resist film is removed, washed and dried, and the process of a substrate for display which is heat-treated is also carried out for whether being Ming after this.
[0012] In addition, it is desirable to shrink the aforementioned resist film by shrinking the patternized resist film according to a thermal effect, or irradiating ozone or oxygen plasma.
[0013]
[Function] First, on the adhesive strength to a substrate, and a concrete target, an indium or an indium alloy has [the adhesive strength to ITO and a glassy substrate front face] good adhesion force. This phenomenon is proved by the pewter for glass etc. Moreover, copper metallurgy is very deficient in especially adhesion force on account of the noble-metals nature. There is other nickel as a strong metal of the adhesive strength to ITO and a glassy substrate front face. Although chromium is also so, the difficulty of plating technology is not simple (of course, there is chromium plating technology).
[0014] Moreover, the indium is possible at the electroplating using solution. In order to deposit an indium, it is not necessary to use a physical-deposition method. The expensive facility of a vacuum evaporationo machine, a sputtering system, etc. is required for a physical-deposition method. Of course, an indium metal can deposit also by the physical technique, such as vacuum evaporationo. Nickel is a metal which is the easiest to plate and electroplating and the selective plating to an ITO top are also possible for it.
[0015] Electric resistance falls most ideally by using copper and metallurgy. Moreover, it is desirable in process to obtain the electrode of low resistance by adding some process to micro processing (this being a process made conventionally) of ITO. This is the following proposals. Namely, the resist film patternized by the desired state is formed on ITO covering the whole principal plane surface of a substrate. Wash by carrying out micro processing by the etching fluid of ITO, and shrink of the aforementioned resist film is carried out. The outcrop of ITO is made to invite and next indium plating or nickel plating is given to this outcrop of ITO, and further, on this, about copper plating or gilding, it is made to wash and dry, and a resist film is removed, washed and dried, and it is [it is desired temperature profiles and] nothing and heat-treating after this. In addition, in the case of copper plating, it is also desirable to perform non-electric-field gilding on the front face of the plated copper from the meaning of a corrosion resistance. It is also an aim further to make copper metallurgy and an indium alloy form and to raise thermal resistance, when indium plating is performed, that the last heat treatment heightens the adhesion force to a substrate and.
[0016] Inspection of an ITO electrode can also be managed with once at this. The last heat treatment has the meaning which raises the adhesive strength of a substrate and the aforementioned alloy in order to advance the alloy reaction of some ground metal indiums, copper, or gold. When a ground metal is nickel, improvement in adhesive strength can be aimed at now.
[0017] in addition, the aforementioned laminating -- in a conductor, there is no prominent effect in the layer of an indium, an indium alloy, or nickel contributing only to the adhesion force to a substrate, and lowering electric resistance Therefore, if even adhesion force is satisfying, the volume of the layer which consists of copper metallurgy should be size compared with the aforementioned layer.
[0018]

[Example] Hereafter, the example of this invention is explained. Here, the matrix display equipment of a simple type is described. However, fundamentally, this example is applied to EL display etc.
[0019] (Example 1) It follows and explains (drawing 1). In a composition cross section and (drawing 1), 1 is a glass substrate and 2 is a layer which an indium metal layer and 5 become in a photoresist and 4, and the gold layer of the front face of a copper layer and 7 become [ITO and 3] from the alloy of indium-copper in a copper layer and 6.
[0020] The #by Corning, Inc. 7059 glass substrate 1 which has ITO all over a principal plane came to hand. Tokyo -- adaptation -- a make positive resist and OFPR were used and it had by the well-known photo lithography method, and as shown in ((drawing 1)a), the resist pattern 3 was made Next, it processed by O2 Usher. Furthermore, micro processing of the ITO was carried out by the hydroiodic acid by the well-known method ((drawing 1)a).
[0021] Next, the substrate was heated at about 150 degrees C or more, and the photoresist was shrunk. Furthermore, the ozone which irradiates ultraviolet rays and is generated washed the outcrop from the resist of ITO ((drawing 1)b).
[0022] The solution made to dissolve an indium sulfate, about 60g, and a sodium sulfate and about 10g in about 1l. pure water performs indium electroplating with a thickness of about 0.1 microns on ITO. Next, it often washes. Furthermore, the solution of an acid copper-sulfate system performed electroplating of copper with a thickness of about 2 microns on this. Furthermore, about 0.2-micron gold layer was formed on this with the non-electric-field plating liquid of commercial gold ((drawing 1)c).
[0023] It exfoliated by the organic solvent, and a resist is often washed, and was dried, and ((drawing 1)d) was obtained.
[0024] Then, to about 150 degrees C, the temperature up was carried out gradually, the temperature up was carried out to the last **** to about 260 degrees C, and the substrate was heat-treated. At this time, that the indium metal layer is the alloy layer of indium-copper became whether to be Ming by Auger electron analysis. In this way, ((drawing 1)e) was obtained. The adhesion force to ITO of these plating layer was what is equal to practical use.
[0025] Sheet resistance of an ITO electrode had fallen by about 1 figure. Like usual, the polyimide film was formed in this substrate and rubbing processing was performed for ** to it using rayon fiber. Lamination and this gap were filled up with the pneumatic liquid crystal constituent for STN so that an ITO film might counter such two substrates, and a gap might become 7.0 microns. There is almost no cross talk and contrast also went up about 50%.
[0026] (Example 2) It follows and explains (drawing 2). For a glass substrate and 9, as for a photoresist and 11, in a composition cross section and (drawing 2), ITO and 10 are [8 / a nickel metal layer and 12] gold layers.
[0027] The #by Corning, Inc. 7059 glass substrate 8 which has ITO9 in a principal plane came to hand. Tokyo -- adaptation -- the make positive resist was used and it had by the well-known photo lithography method, and as shown in ((drawing 2)a), the resist pattern 10 was made Next, it processed by O2 Usher. Next, micro processing of the ITO was carried out with the commercial **** solution, and ((drawing 2)a) was obtained.
[0028] Next, a substrate is exposed to oxygen plasma by the dry etcher for about 20 minutes. In this way, generally the effect of having shrunk the photoresist generates the edge of a resist on parenchyma with decomposition of the resist material by oxygen plasma being more quick. That is, the outcrop from the pure resist of ITO is obtained (b). (drawing 2)
[0029] Next, about 0.5-micron nickel electroplating was alternatively performed only to the aforementioned outcrop using the commercial chemical. It is very important in order that control of deposit speed may prevent film peeling of a nickel layer at this time. Furthermore, about 1.5-micron gold layer is obtained with golden electric-field plating liquid (c). (drawing 2)
[0030] It exfoliated with the organic chlorine-based solvent, and a resist is often washed, and was dried, and ((drawing 2)d) was obtained.
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[0033]
[Effect of the Invention] this invention is size above the place which offers the leading method for realizing improvement in the display grace of display, and contributes to industry.

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MEANS

[Means for Solving the Problem] In order that this invention may solve the above technical problems, on the transparent electrode covering the whole principal plane surface of a substrate Form the resist film patternized by the desired state and micro processing is carried out by the etching fluid of a transparent electrode. Wash, next shrink the aforementioned resist film and the outcrop of a transparent electrode is defecated with ozone or oxygen plasma. Indium electric-field plating is given to the outcrop of a transparent electrode. on this further Copper monolayer electric-field plating This order is made to give and wash and dry the electric field of golden monolayer electric-field plating or copper electric-field plating, and gold, or two-layer plating of non-electric-field plating, and a resist film is removed, washed and dried. or by desired temperature profiles after this The process of a substrate for display which is heat-treated to a desired maximum temperature is offered.
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OPERATION

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(19)日本国特許庁（ＪＰ）　(12)**公開特許公報（Ａ）**　(11)特許出願公開番号

特開平6－148661

(43)公開日　平成６年(1994)５月27日

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審査請求　未請求　請求項の数４（全　５　頁）

(21)出願番号　特願平4－301957

(22)出願日　平成４年(1992)11月12日

(71)出願人　000005821
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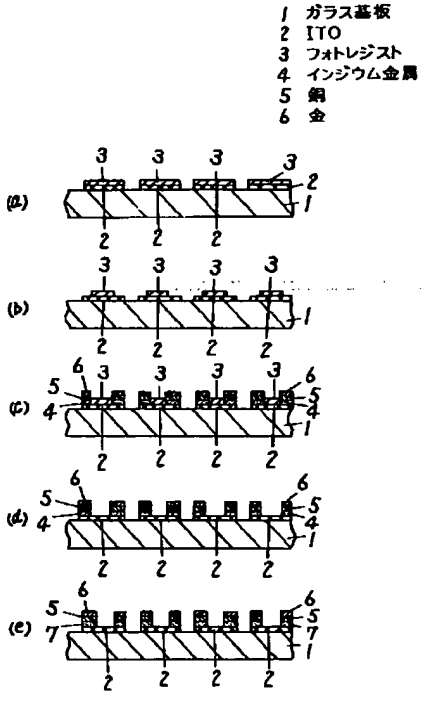
(74)代理人　弁理士　小鍛冶　明　（外２名）

(54)【発明の名称】　表示装置用基板の製法

(57)【要約】

【目的】　本発明は、表示品位を向上させるための方法を提案するものである。

【構成】　沃化水素酸で、ＩＴＯ２を微細加工し、基板を加熱し、フォトレジスト３を縮ませ、さらに、紫外線を照射し、発生するオゾンにより、ＩＴＯ２のレジスト３からの露出部を洗浄し、硫酸インジウムと硫酸ナトリウムを純水に溶解させた溶液で、インジウム電気鍍金４をＩＴＯ上に形成する。次に、よく洗浄し、酸性の硫酸銅系の溶液で、この上に、銅５の電気鍍金を行い、さらに、金の無電界鍍金液により、この上に金層６を形成し、レジスト３を有機溶剤で剥離し、洗浄、乾燥させ、この後、基板を熱処理する。



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【特許請求の範囲】

【請求項1】基板の主面全面に亘る透明電極の上に、所望の状態にパターン化されたレジスト膜を形成し、透明電極の腐食液で微細加工をし、洗浄し、次に前記レジスト膜を縮まらせ、透明電極の露出部をオゾンまたは酸素プラズマで清浄化し、透明電極の露出部にインジウム電界鍍金を施し、更に、この上に、銅単層電界鍍金または、金単層電界鍍金または、銅電界鍍金と金の電界または無電界鍍金の2層鍍金をこの順に施し、洗浄、乾燥させ、レジスト膜を除去、洗浄、乾燥させ、この後、熱処理することを特徴とする表示装置用基板の製法。

【請求項2】基板の主面全面に亘る透明電極の上に、所望の状態にパターン化されたレジスト膜を形成し、透明電極の腐食液で微細加工をし、洗浄し、次に前記レジスト膜を縮まらせ、透明電極の露出部をオゾンまたは酸素プラズマで清浄化し、透明電極の露出部にニッケル電界または無電界鍍金を施し、更に、この上に、銅単層電界鍍金または、金単層電界または無電界鍍金または、銅電界鍍金と金の電界または無電界鍍金の2層鍍金をこの順に施し、洗浄、乾燥させ、レジスト膜を除去、洗浄、乾燥させ、この後、熱処理することを特徴とする表示装置用基板の製法。

【請求項3】パターン化されたレジスト膜を、熱的効果により縮まらせることを特徴とする請求項1または2記載の表示装置用基板の製法。

【請求項4】パターン化されたレジスト膜に、オゾンまたは酸素プラズマを照射することにより、前記レジスト膜を縮まらせることを特徴とする請求項1または2記載の表示装置用基板の製法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、液晶表示装置等、表示装置用基板の製法に関する。特に電極の抵抗を一段と下げることに関する。

【0002】

【従来の技術】液晶表示装置等、表示装置は、マン・マシーン・インターフェースとしては、是非必要となる技術である。特に、最近、コンピューター端末等において、ダウン・サイジングの意味からも、液晶表示装置は必須となってきた。

【0003】電気抵抗値、生産時の制御性、膜の均一性、光の透過率、微細加工性等の点から、産業的には、圧倒的に、インジウム－錫の酸化物（いわゆるＩＴＯ）が使われている。

【0004】この技術内容は、「薄膜ハンドブック」、日本学術振興会第１３１委員会　編、オーム社刊に詳しい。

【0005】

【発明が解決しようとする課題】最近、コンピューター端末等に使われる液晶表示装置において、高品位表示の

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要求が現実のものとなってきた。これらの液晶表示装置においては、ＳＴＮ等、単純モードの液晶表示装置が主に使われている。これらの液晶表示装置には、表示において、クロストーク現象等、表示の質の低下が見られるが、現状では仕方なく使われている。

【0006】この現象は、透明電極（ＩＴＯ）の電気抵抗値が十分、低くなく、従って、ＣＲ時定数が大きいことに起因する。現在の技術では、ＩＴＯの比電気抵抗率は、$2\times10^{-4}\Omega cm$程度までしか、達成されていない。ちなみに、金や銅、アルミニウムの比抵抗率は、$2\times10^{-6}\Omega cm$程度である。

【0007】ところが、金や銅、アルミニウムをＩＴＯに接して配線された（いわゆる補助電極）基板の開発がなされているが、この場合、ＩＴＯや基板への接着強度の欠如が問題となる。

【0008】また、この補助電極形成のコストは出来るだけ、低減させることが要求される。例えば、フォトリソグラフィー法及び蒸着プロセスを用いた方法は、確実なものであるが、コストが高く、とても一般に使われる方法とは考えられない。

【0009】また、この問題は、強誘電性液晶表示装置においてもあてはまる。

【0010】

【課題を解決するための手段】本発明は前述のような課題を解決するために、基板の主面全面に亘る透明電極の上に、所望の状態にパターン化されたレジスト膜を形成し、透明電極の腐食液で微細加工をし、洗浄し、次に前記レジスト膜を縮まらせ、透明電極の露出部をオゾンまたは酸素プラズマで清浄化し、透明電極の露出部にインジウム電界鍍金を施し、更に、この上に、銅単層電界鍍金または、金単層電界鍍金または、銅電界鍍金と金の電界または無電界鍍金の2層鍍金をこの順に施し、洗浄、乾燥させ、レジスト膜を除去、洗浄、乾燥させ、この後、所望の温度プロフィールで、所望の最高温度まで熱処理するような表示装置用基板の製法を提供するものである。

【0011】本発明はさらに、基板の主面全面に亘る透明電極の上に、所望の状態にパターン化されたレジスト膜を形成し、透明電極の腐食液で微細加工をし、洗浄し、次に前記レジスト膜を縮まらせ、透明電極の露出部をオゾンまたは酸素プラズマで清浄化し、透明電極の露出部にニッケル電界または無電界鍍金を施し、更に、この上に、銅単層電界鍍金または、金単層電界または無電界鍍金または、銅電界鍍金と金の電界または無電界鍍金の2層鍍金をこの順に施し、洗浄、乾燥させ、レジスト膜を除去、洗浄、乾燥させ、この後、熱処理するような表示装置用基板の製法をも明かにする。

【0012】なお、パターン化されたレジスト膜を、熱的効果により縮まらせるか、オゾンまたは酸素プラズマを照射することにより、前記レジスト膜を縮まらせるの

が、望ましい。

【0013】

【作用】まず、基板への接着力、具体的には、ＩＴＯ並びに、ガラス質基板表面への接着力は、インジウムないし、インジウム合金が付着力が良好である。この現象は、ガラス用ハンダ等で実証されている。また、特に銅や金はその貴金属性の故に付着力は極めて乏しい。ＩＴＯ並びに、ガラス質基板表面への接着力の強い金属としては、他に、ニッケルがある。クロムもそうであるが、鍍金技術の困難さは尋常でない（クロム鍍金技術は、勿論、あるが）。

【0014】また、インジウムは、水溶液を使った、電気鍍金で可能である。インジウムを析出させるため、物理的析出法を使う必要がない。物理的析出法は、蒸着機やスパッター装置等、高価な設備が必要である。もちろん、インジウム金属は、蒸着等、物理的手法でも析出可能であるが。ニッケルは、もっとも鍍金し易い金属であり、電気鍍金や、ＩＴＯ上への選択鍍金も可能である。

【0015】電気抵抗は、銅、や金を使用することにより、最も理想的に下がる。また、プロセス的に、ＩＴＯの微細加工（これは、従来なされるプロセスである）に、若干のプロセスを追加することにより、より低抵抗の電極を得るのが望ましい。これが、以下の提案である。すなわち、基板の主面全面に亘るＩＴＯの上に、所望の状態にパターン化されたレジスト膜を形成し、ＩＴＯの腐食液で微細加工をし、洗浄し、前記レジスト膜をシュリンクさせ、ＩＴＯの露出部を招来させ、次にこのＩＴＯの露出部にインジウム鍍金ないしニッケル鍍金を施し、更に、この上に、銅鍍金ないし、金鍍金をなし、洗浄、乾燥させ、レジスト膜を除去、洗浄、乾燥させ、この後、所望の温度プロフィールで、熱処理することである。なお、銅鍍金の場合、耐腐食性の意味から、鍍金された銅の表面に無電界金鍍金を行うのも、望ましい。最後の熱処理は、基板への付着力を高めること、さらに、インジウム鍍金を行った場合は、銅や金とインジウム合金を形成させ、耐熱性を向上させることもねらいである。

【0016】これでは、ＩＴＯ電極の検査も一度で済む。最後の熱処理は、下地金属インジウムと銅、あるいは金の一部の合金反応を進めるためと、基板と前記合金との接着力を向上させる意味もある。下地金属がニッケルの場合も、これで接着力の向上が図れる。

【0017】なお、前記積層導体において、インジウムないしインジウム合金ないしニッケルの層は基板への付着力にのみ寄与するものであり、電気抵抗を下げるには卓効はない。従って、付着力さえ、満足出来れば、銅や金からなる層の体積は、前記層に比べて、大であるべきである。

【0018】

【実施例】以下、本発明の実施例を説明する。ここで

は、単純型のマトリクス表示装置について述べる。しかし、この実施例は基本的には、ＥＬ表示装置等にもあてはまるものである。

【0019】（実施例１）（図１）に従って説明する。構成断面図、（図１）において、１はガラス基板、２はＩＴＯ、３はフォトレジスト、４はインジウム金属層、５は銅層、６は銅層の表面の金層、７はインジウム－銅の合金からなる層である。

【0020】ＩＴＯを主面全面に有するコーニング社製＃７０５９ガラス基板１を入手した。東京応化製ポジレジスト、ＯＦＰＲを使い、公知のフォトリソグラフィー法でもって、（図１）（ａ）の如く、レジストパターン３を作った。次に、O2アッシャーで、処理した。さらに、公知の方法で、沃化水素酸で、ＩＴＯを微細加工した（図１）（ａ）。

【0021】次に、約１５０℃以上に基板を加熱し、フォトレジストを縮ませた。さらに、紫外線を照射、発生するオゾンにより、ＩＴＯのレジストからの露出部を洗浄した（図１）（ｂ）。

【0022】硫酸インジウム、約６０グラムと、硫酸ナトリウム、約１０グラムを約１リットルの純水に溶解させた溶液で、約０．１ミクロンの厚みのインジウム電気鍍金をＩＴＯ上に行う。次に、よく洗浄する。更に、酸性の硫酸銅系の溶液で、この上に、約２ミクロンの厚みの銅の電気鍍金を行った。さらに、市販の金の無電界鍍金液により、この上に約０．２ミクロンの金層を形成した（図１）（ｃ）。

【0023】レジストを有機溶剤で剥離し、よく洗浄し、乾燥させ、（図１）（ｄ）を得た。

【0024】この後、約１５０℃まで、徐徐に昇温し、最終てきには約２６０℃まで、昇温させ、基板を熱処理した。この時、インジウム金属層は、インジウム－銅の合金層になっているのが、オージェ電子分析によって明かになった。かくて、（図１）（ｅ）を得た。これら、鍍金層のＩＴＯへの付着力は実用に耐えるものであった。

【0025】ＩＴＯ電極のシート抵抗は、約１桁下がっていた。通常の如く、この基板に、ポリイミド膜を形成し、をレーヨン繊維を用いて、ラビング処理を行った。このような２枚の基板を、ＩＴＯ膜が対向するように、間隙が７．０ミクロンとなるように、貼り合わせ、この間隙にＳＴＮ用ネマティック液晶組成物を充填した。クロストークは、ほとんど無く、コントラストも約５０％上昇した。

【0026】（実施例２）（図２）に従って説明する。構成断面図、（図２）において、８はガラス基板、９はＩＴＯ、１０はフォトレジスト、１１はニッケル金属層、１２は金層である。

【0027】ＩＴＯ９を主面に有するコーニング社製＃７０５９ガラス基板８を入手した。東京応化製ポジレジ

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ストを使い、公知のフォトリソグラフィー法でもって、（図2）（a）の如く、レジストパターン10を作った。次に、O2アッシャーで、処理した。次に、市販の塩鉄溶液でITOを微細加工して、（図2）（a）を得た。

【0028】次に、基板をドライエッチャーで、約20分、酸素プラズマに晒す。かくして、レジストの端部は、一般に、酸素プラズマによるレジスト材料の分解がより速いことにより、実質上、フォトレジストを縮ませた効果が発生する。すなわち、清浄なITOのレジストからの露出部が得られる（図2）（b）。

【0029】次に、市販の薬品を用い、前記露出部にのみ、選択的に、約0．5ミクロンのニッケル電気鍍金を行った。この時、析出速度の制御は、ニッケル層の膜剥がれを防ぐため、非常に重要である。さらに、金の電界鍍金液により、約1．5ミクロンの金層を得る（図2）（c）。

【0030】レジストを有機塩素系溶剤で剥離し、よく洗浄し、乾燥させ、（図2）（d）を得た。

【0031】この後、基板を約100℃で熱処理した。これら、鍍金層のITOへの付着力は実用に耐えるものであった。

【0032】ITO電極のシート抵抗は、約1桁下がっていた。通常の如く、この基板に、ポリイミド膜を形成し、をレーヨン繊維を用いて、ラビング処理を行った。

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このような2枚の基板を、ITO膜が対向するように、間隙が7．0ミクロンとなるように、貼り合わせ、この間隙にSTN用ネマティック液晶組成物を充填した。クロストークは、ほとんど無く、コントラストも約40％上昇した。

【0033】

【発明の効果】以上本発明は、表示装置の表示品位の向上を実現するに有力な方法を提供するものであり、産業に貢献するところ大である。

【図面の簡単な説明】

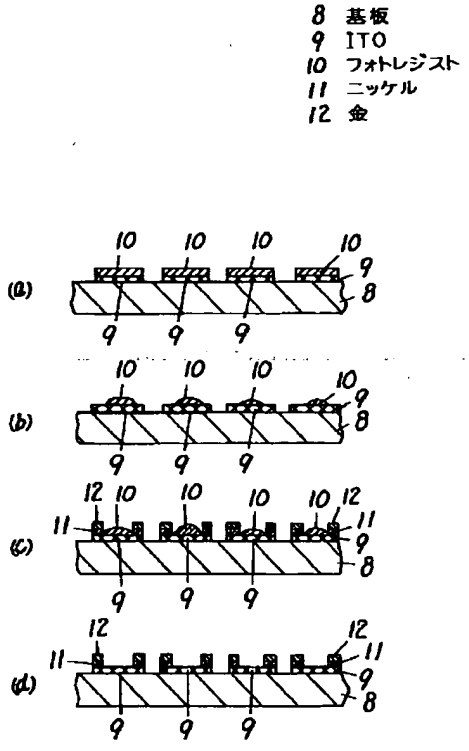
【図1】本発明の実施例を説明するための構成断面図

【図2】本発明の実施例を説明するための構成断面図

【符号の説明】

1　ガラス基板
2　ITO
3　フォトレジスト
4　インジウム金属層
5　銅層
6　銅層の表面の金層
7　インジウムー銅の合金からなる層
8　ガラス基板
9　ITO
10　フォトレジスト
11　ニッケル金属層
12　金層

【図2】



【図1】

1 ガラス基板
2 ITO
3 フォトレジスト
4 インジウム金属
5 銅
6 金